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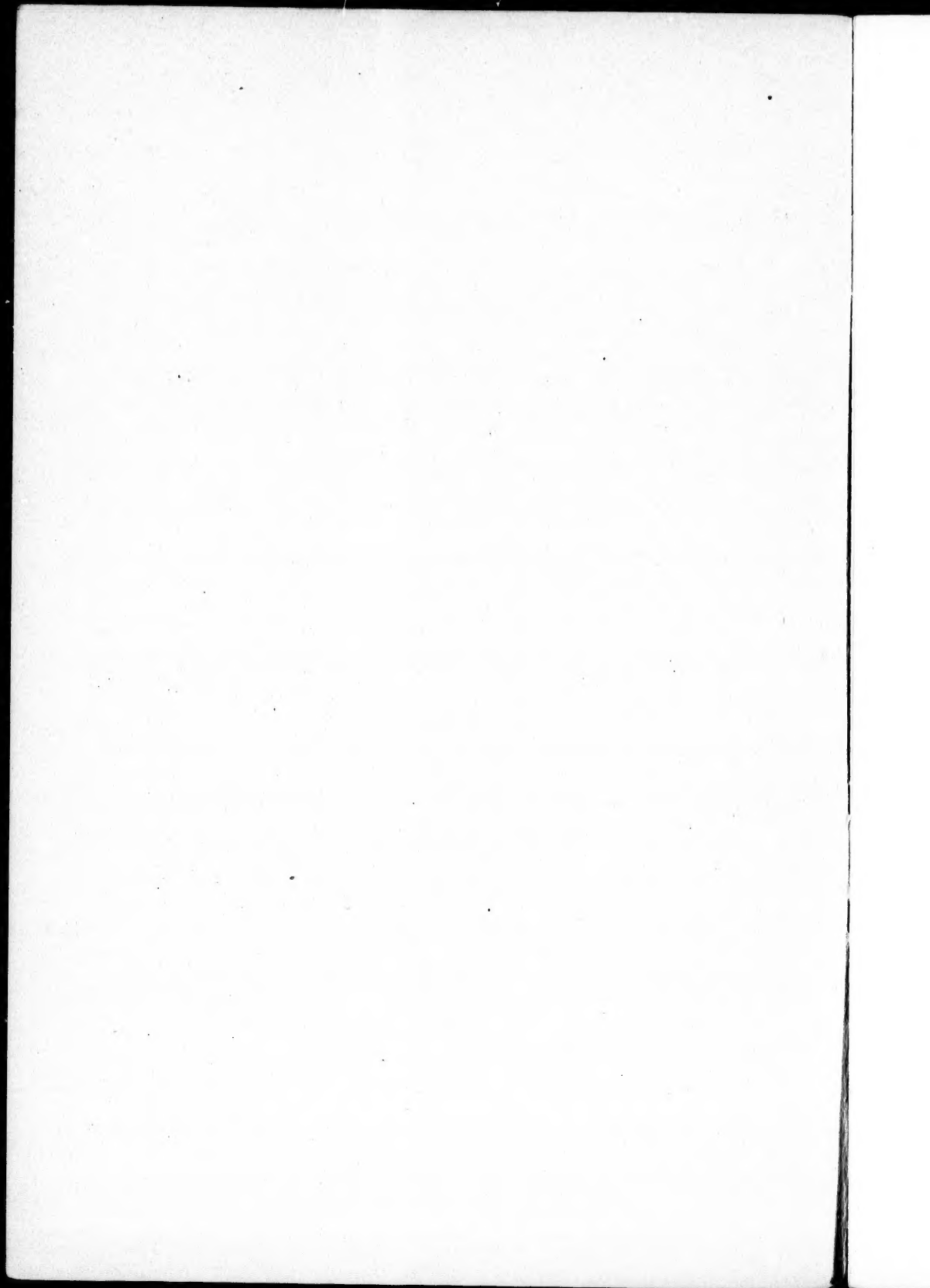
**THE ACCURATE MEASUREMENT OF SPINAL CURVATURES WITH THE
DESCRIPTION OF A NEW INSTRUMENT FOR THE PURPOSE.**

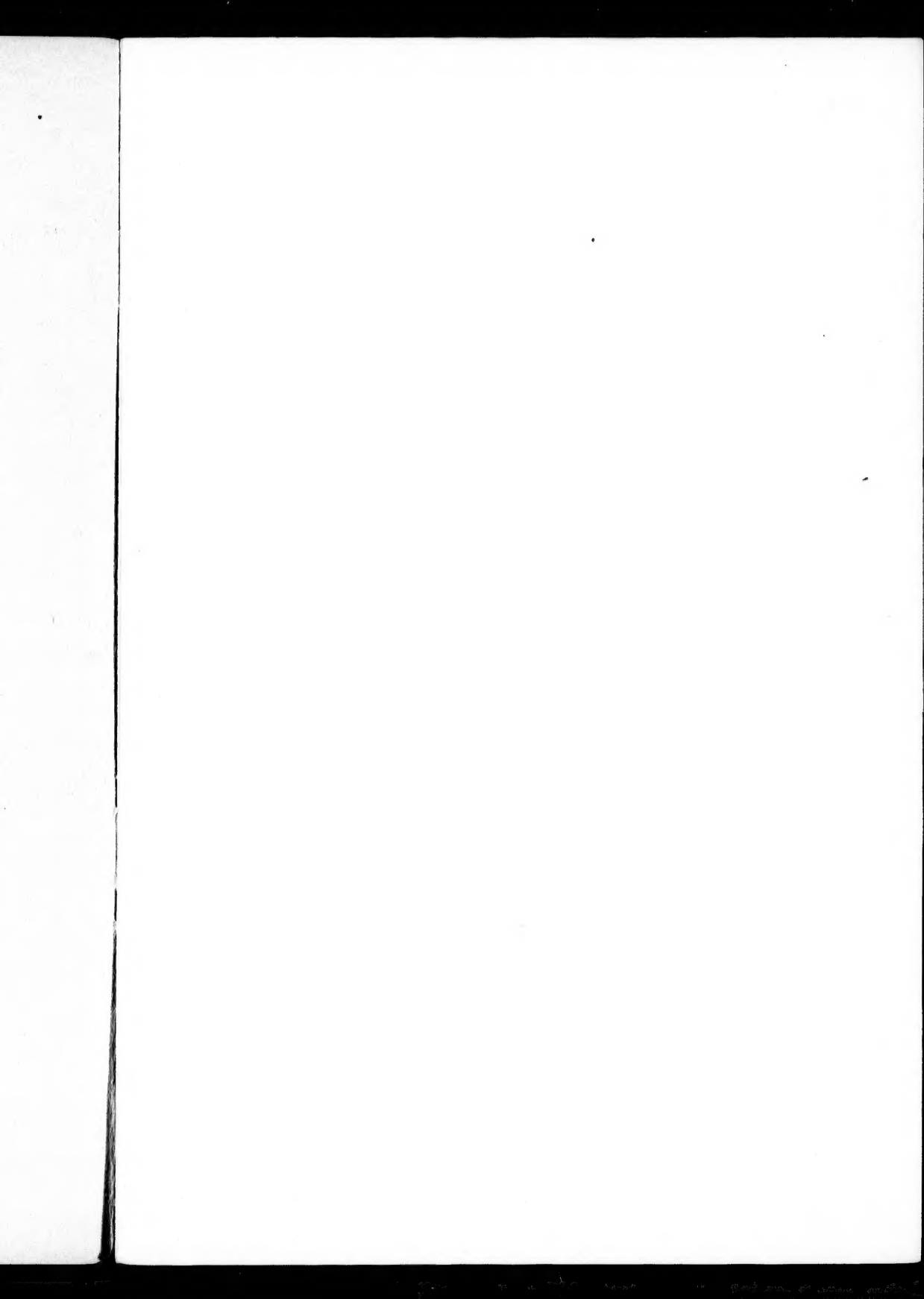
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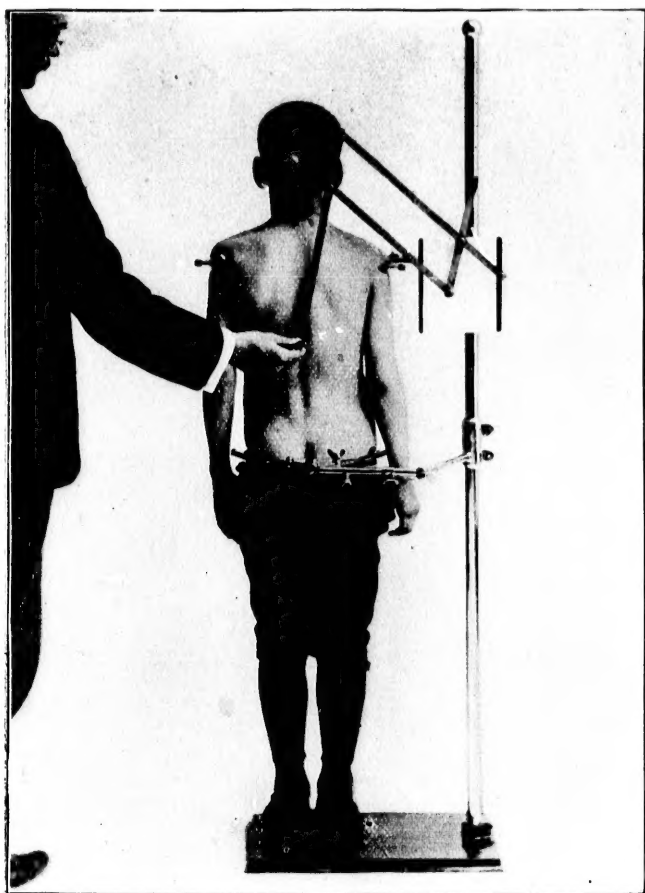
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THE ACCURATE MEASUREMENT OF SPINAL CURVATURES,
WITH THE DESCRIPTION OF A NEW INSTRUMENT FOR THE PURPOSE.

BY

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Almost the first difficulty that confronts the surgeon in dealing with a case of scoliosis is the obtaining of definite date on which to base a diagnosis and prognosis, a fixed starting point from which he can follow its progress; a standard by which he can test his course of treatment with a reasonable degree of accuracy.

Mere opinion as to the exact condition present in a patient is notoriously unscientific and inaccurate, especially in this disease, and a few figures in black and white, or an accurate chart, are worth pages of surmise or supposition.

In the measurement of curvatures we must obtain a record of the general asymmetry of the figure, as well as of the details of the deformity. One wants some quick and accurate way of getting at the difference in height of the acromia, of the points of the scapulæ, some graphic record of the deviation of the spinous processes from the straight line, of the differences in outline and level of the hips and iliac crests. And, again, the record will not be complete unless the rotation of the vertebræ is shown, both in the dorsal and lumbar regions. In angular curvature the nature and extent of the kyphosis must be displayed to give a clinical picture of the case.

Many methods have been used to get some of these results, and some plans have been used to get many of them, but I have not yet seen any practical scheme by which a complete picture such as I have just described has been obtained.

I need not enter into a detailed description of all the ways by which this subject has been attacked, but, among them, photography has certainly been the most popular. Perhaps the most fatal objections to its use as a routine practice are its expense, both in time and money, and its liability to mislead the observer by indistinctness, or other imperfections in the process of lighting the figure, or the developing of the plates.

Many plans have been described in which plumb lines are dropped

and deviations from them noted at different levels. The shoulder levels have been measured from the ground, and various other isolated facts have been taken. These methods are all imperfect and cumbersome, and, above all, lack that uniformity so necessary if such observations are to be of permanent value.

For recording the rotation which is totally neglected by the above-mentioned plans, Mr. Bernard Roth describes a method which is both rapid and accurate. The complete description of it is found in his text-book on the subject. Briefly, it is by moulding a strip of pure tin to the back at the desired level and making a tracing from this on paper.

Mary Putman Jacobi elaborates this method by using a hinged tape and encircling the whole chest or abdomen. This tape is removed, placed on a table, and plaster is run in, forming an accurate cross-section of the body at the level selected. This, although accurate, is imperfect, and its inconvenience in private practice will at once suggest itself.

Dr. Geo. W. Fitz, in *Boston Medical and Surgical Journal*, recommends, in measurements of the spine, to spot with a black-flesh pencil, the spinous processes from the seventh cervical vertebra down to the sacrum, together with the posterior iliac spines; to place the patient behind a screen consisting of a rectangular frame with threads strung vertically and horizontally, cutting the entire surface in inch squares to measure the amount of rotation of the spine; he uses the method described by Mr. Roth.

In the *Cyclopedia of Diseases of Children*, Dr. R. E. Roth describes a small instrument for recording rotation, which merits description.

A long pointer, with a pencil attached, moves freely by a swivel joint on a stand placed on the back of the patient, who bends well forward. Attached to the stand is a curved sheet of paper on which the pencil marks the movement of the pointer, the tracing being of course reversed; by varying the proportion of the two sections of the pointer the tracing can be made to any scale.

J. A. Weegel describes a graphic method of showing a cross-section (natural size) of the prone figure. This is open to the serious objection that the scapulæ and attached muscles mask to a great extent all sections taken in the upper dorsal region, an objection surmounted by having the patient stooping well forward.

Raymond Sainton took up this subject very fully in the *Revue d'Orthopédie* some years ago and described a hinged collar or belt of steel, in which the patient is encircled. Set in it at regular intervals are pointers like wheel spokes. These are shoved in till they touch the

skin, clamped, and the collar removed. A tracing from these pointers will show the body in cross-section. He also figures an adaptation of the pantograph for taking full-sized tracings of the spinous processes.

Many instruments have been devised, all more or less complicated and expensive, for taking such tracings. The most elaborate I have seen, that of Schulthess, though accurate, gives a tracing life size, and too big for convenience. It is not adapted to record rotation. Its size and expense would make its general introduction impossible. Beehrings uses a glass plate on which the silhouette is traced, but I could multiply example on example till one is tempted to cry that of making many devices there is no end, and yet one must agree with the author in a recent work on Orthopœdic Surgery when he says that "An inexpensive and efficient scoliosiameter is yet to be invented."

An efficient instrument should record in inches or centimeters the difference in levels, of the shoulders, of the points of the scapulæ, and of the iliac crests. It should measure the deviation of the spinous processes at all levels. It should show the outline of the hips and shoulders that differences may be noted, and, lastly, it should measure the amount and show the nature of rotation when present.

In this instrument an attempt has been made to fulfil these conditions. It consists of a fixed horizontal iron stand, into which a rigid upright rod is screwed firmly. To this rod two arms are attached by collars that can be moved up and down or clamped by thumb screws. The lower arm passes behind the patient and clamps the hips, preventing any sidewise movement. The upper arm passes in front of the patient and fixes the shoulders. To the collar of the upper arm is attached, by a hinge, a plate, to which a pantograph is screwed, set so as to make a tracing reduced to one in four. The paper, which is stretched over this plate and held by clips behind, is ruled in eighth inch squares. Hence, a line passing vertically through eight squares or one inch, would represent a distance of four inches covered by the pointer. It is more accurate and convenient to use a reversible pointer, a short arm for the spine and scapulæ, and a longer for the outline of the shoulders and hips.

To take a tracing the spinous processes are first marked with a flesh pencil and the patient is placed upon the stand. The hips are first clamped at the level of the trochanters, the shoulder arm is then moved up or down, adjusted and clamped, after the patient has settled into the habitual position. The spine is followed by the pointer, the gluteal cleft and the points of the scapulæ noted, and then an outline of the shoulders and hips is rapidly traced.

In taking cross-sections to show the rotation, the patient stands bent over, and the end of the pantograph easily follows the outline of the back at any desired level.

The amount of the difference in levels, or the deviation, is obtained by following the horizontal or vertical lines and counting the squares on the paper, for you have an accurate map drawn to scale of the back and its bony points.

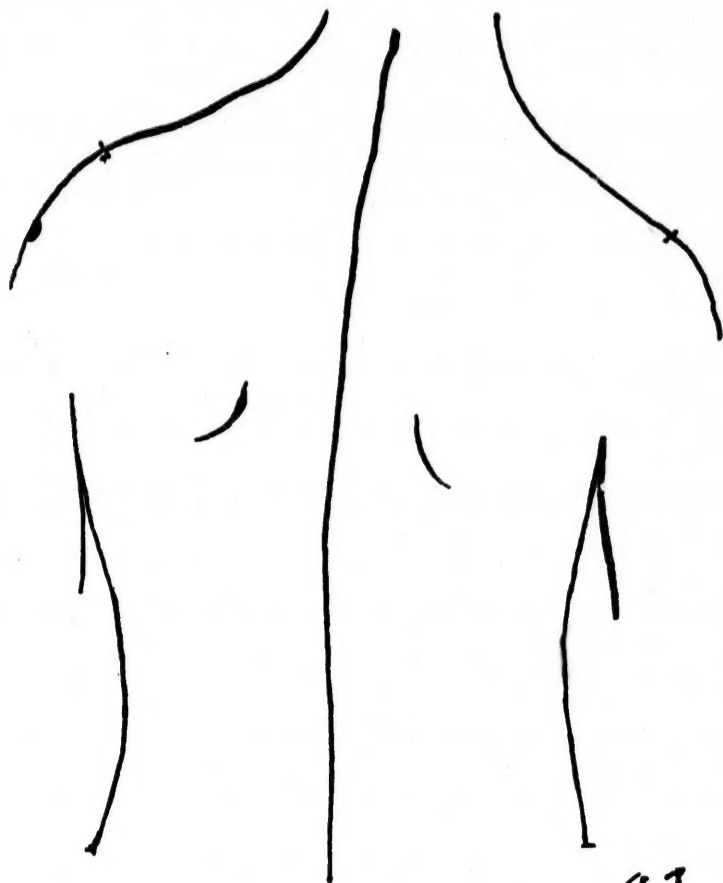
The plates will illustrate better than words can describe the forms of certain typical cases from my case book. Fig. I. is from a young man, the difference at the acromia being $2\frac{1}{2}$ inches, taken when standing with heels together, and in his habitual position.

In Fig II. the cause of the curvature is shown in the difference of height of the iliac crests and tilting of the pelvis, due in this case to shortening of the left leg. The cross-section taken at the level of the third lumbar vertebra shows a projection of the right side and a corresponding depression of the left.

Fig. III. shows a very extreme deformity, due to infantile paralysis. The projection of the left hip is very noticeable.

Fig. IV. shows two tracings plotted on the same chart, the iliac crests being taken as the starting points. It will be seen from this how improvement under treatment can be clearly demonstrated.

If we could select some standard set of measurements instead of continuing in the present haphazard way, every man having a system which may serve for himself, but is a sealed book to his neighbor, there would be a chance of comparing our work one with another, and arriving at results in the treatment of scoliosis that would be at once definite, intelligible and scientific.



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